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EPA-1				Explain how a grid of 15 to 30 m is appropriate to catch differences seen at transition areas (e.g., shorelines).	The level of grid resolution (i.e., size and number of grid cells) chosen for any modeling study requires a balance between adequately simulating hydrodynamic, sediment transport and chemical fate and transport processes and the ability to conduct multi-year simulations (e.g., 20-year simulations) within a practical length of time. The proposed level of grid resolution (i.e., 15 to 30 m) is based on a combination of preliminary model testing using this grid resolution and previous experience in conducting similar modeling studies at over 40 sites. Based on preliminary model testing and professional judgment, the proposed level of grid resolution is adequate to meet the objectives of the modeling study. The resolution may be revised, however, if the results indicate that the model is not capturing large gradients that may occur in transitional areas.
EPA-2	4.1, 4.2, 4.3, 5.3.1			List and describe types of high flow, storm event, flood event, and hurricane event data needed and where it will be obtained.	The hydrodynamic model requires two types of boundary condition data to simulate high-flow (flood) events and hurricanes: 1) freshwater inflow from San Jacinto River (upstream boundary of model); and 2) water surface elevation (downstream boundary of model). The freshwater inflow during floods will be specified using flow rate data obtained from the Coastal Water Authority discharge station at Lake Houston dam and USGS gauging stations on the San Jacinto River. Water surface elevation during a hurricane will be specified using data obtained at the NOAA tidal gauging station at Battleship Texas State Park.
EPA-3				The chemical fate and transport model (QEAFATE) description alludes to covering colloidal interactions but did not discuss bioturbation in detail, this exchange mechanism is very important (see Lampert and Reible, 2009 capping model). The K-saponite represents a type of clay mineral surface that one would expect to find in these sediments. The moderate affinity of PCDDs and PCDFs for these types of clay minerals may represent a problem associated with colloid assisted transport of suspended clay particles carrying PCDDs and PCDFs offsite.	The chemical fate and transport model does simulate the effects of bioturbation, as discussed on p. 9 and 10 of the modeling study addendum. QEAFATE uses a bed model that has multiple layers, with the number of layers and thickness of the layers specified as a model input. Particle mixing within the bed due to bioturbation is simulated in the bed model by specifying the rate of mixing between the layers and the depth of mixing. Both the mixing rates and depth are specified as model inputs. The depth of mixing will be determined through analysis of vertical profiles of chemical concentrations and radioisotope activity form sediment cores collected within the Study Area. The rate of mixing between the layers will be adjusted during model calibration. The model does not specify clay mineral types, such as K-saponite; however, it does include consideration of clay sized particles and their interaction with the water column. The model simulates temporal and spatial changes in the composition of sediment in the water column and sediment bed. In addition, the model has the capability to track the fate and transport of sediment from specific locations or sources. For any particle-associated chemical, the total chemical concentration in the water column or sediment bed is the sum of the dissolved and particulate concentrations. The relative proportions of dissolved and particulate concentrations is determined by the partition coefficient for a specific chemical, with the relative amount of the particulate component increasing as the value of the partition coefficient increases.
EPA-4				Is the Sedflume data being used to verify the SEDZLJ sediment transport model, or if not, what if the data conflicts with the model?	Sedflume core data provide information on the erosion properties of cohesive (muddy) bed sediments. These data are used to develop erosion parameters that are input to the sediment transport model. Thus, the Sedflume core data are not used to calibrate and validate the sediment transport, or evaluate the predictive capabilities of the model.
EPA-5				The approach suggests that these models can also be used to evaluate remediation alternatives, but no further description of the types of remediation were provided that would suggest the limits of such approach (i.e., removal vs. containment vs. treatment).	The modeling framework (i.e., linked hydrodynamic, sediment transport, and chemical fate and transport models) will be used as one line-of-evidence in a weight-of-evidence approach to evaluate and compare a range of remediation alternatives during the Feasibility Study (FS). The general types of remediation alternatives to be evaluated during the FS may include, but are not limited to: 1) monitored natural recovery; 2) capping (containment); 3) in situ treatment; and 4) removal. The potential limitations of the predictive capability and reliability of the modeling framework with respect to evaluating remedial alternatives cannot be determined at the present time. Any limitations of the modeling framework for its usefulness during the FS will be determined during the model study.
EPA-6				The hydrodynamic model description (EFDC) provided on page 7 does not list ground water recharge or discharge.	Interactions between groundwater and surface water will not be explicitly incorporated into the hydrodynamic model. The San Jacinto River within the Study Area is a tidal system, which makes it extremely difficult to accurately estimate the relatively small amount of groundwater recharge or discharge that interacts with the surface water. With respect to the hydrodynamics of the river, groundwater flow will have a negligible effect on circulation in the Study Area because of the negligible amount of groundwater flow (compared to the river discharge and tidal flow).
EPA-7				Hydrodynamic Model: Calibration for the hydrodynamic modeling includes measurements of current velocities for at least one (1) high-flow event (Section 5.3.1). A high-flow event is defined as an event with a flowrate of at least 10,000 cfs (Section 3.5.1). Per the subject report (Section 3.5.1), such an event is less than one-third the flowrate of a two-year return event. The TCEQ notes that model calibration based on flowrates from such a frequent return period may not allow significant extrapolation by the model to less frequent return periods.	A similar approach has been successfully used during modeling studies at other contaminated sediment sites. See the response to comment EPA-42 for additional discussion of this issue.
EPA-8	5.4.1			Sediment Transport Model: Section 5.4.1 states that a total of 68 surface samples will be taken for the Bed Property Study. However, Figure 4 shows the locations of the surface samples, in which there are more than 68 locations. From these data, it is unclear how many surface samples will be collected and where their locations may be.	Figure 4 shows the bed probing locations and not the surface sampling locations. The title of the figure will be modified accordingly. The 68 surface samples discussed in Section 5.4.1 were collected in May 2010 as part of the sediment Sampling and Analysis Plan (SAP) and those samples are not part of the bed property study to support the sediment transport modeling. For the modeling study, 30 additional samples will be collected, as described in Section 5.4.1.2. The 68 samples collected for the SAP are located within the primary Study Area (i.e., within the vicinity of the waste

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					impoundment area). The 30 samples collected during this study are located upstream and downstream of the primary Study Area and collocated with the bed probing sites that are depicted in Figure 4.
EPA-9	5.4.1			Sediment Transport Model: Section 5.4.1 states that the impoundment surface sediment also will be sampled. However, Figure 4 shows no sediment sampling at the location of the impoundment. The TCEQ considers the determination of the erodibility of impoundment sediments to be essential to any sediment transport modeling effort.	The sampling described in Section 5.4.1 will provide data on bulk bed properties (i.e., grain size distribution, dry density). The erosion properties of cohesive sediments will be measured during the Sedflume study (see Section 5.4.2). Sediment cores will be collected from 15 locations, with the cores collected from three distinct areas: 1) in the immediate vicinity, but outside of the perimeter of the waste impoundments; 2) upstream of the waste impoundments; and 3) downstream of the waste impoundments. The impoundments will be covered to prevent erosion and stabilize the site for all options being considered in the Time Critical Removal Action (TCRA) planned to occur in 2010. Any sampling done within the impoundments prior to the TCRA for post-construction RI/FS evaluations will be irrelevant.
EPA-10	5.4.3			Sediment Transport Model: Section 5.4.3 states that the net sedimentation rates will be determined by age dating using radioisotopes. The TCEQ is concerned that samples obtained San Jacinto River Waste Pits from areas in a channel that is being actively dredged (for shipping) are not suitable for net sedimentation rate studies. Therefore, it is necessary to understand where dredging occurs in the Study Area. Additionally, it is also important to understand where dredging spoils may be deposited in the study area.	The radioisotope cores will not be collected from areas that are being actively dredged or that have been affected by dredging or are located downstream of dredging disposal locations. A thorough review of available information and data related to past and present dredging and disposal activities in the Study Area will be conducted to guide selection of the radioisotope core locations.
EPA-11				Sediment Transport Model: The possible effects of dredging in the San Jacinto River upstream of the Study Area may also affect the calibration of the sediment transport model in the most dynamic section of the channel(s). The TCEQ requests some discussion regarding how the proposed modeling will account for the additional physical complexity introduced by the effects of possible nearby dredging.	The effects of past dredging on the sediment transport model are primarily due to changes in bathymetry and geometry of the river channel and adjacent areas. Changes in bathymetry and geometry due to dredging will be incorporated into the model through the data provided by the bathymetric survey discussed in Section 5.3.2. Use of recently collected bathymetric data in the model will adequately account for the effects of dredging in the model.
EPA-12				Sediment Transport Model: Storm surge from recent major storms (e.g., Hurricanes Ike, Rita, and flood of October 1995) may also have complicated sedimentation history of this estuarine system. Such effects will further confound the model calibration process.	The inclusion of major storm events in the calibration period for the sediment transport model provides a strong test of the predictive capabilities of the model. If the model is able to be adequately calibrated during a period when major storms occurred, then the confidence in the reliability of the model will significantly increase.
EPA-13				Chemical Fate and Transport Modeling: Calibration of chemical partitioning in sediment, whether equilibrium or disequilibrium, also can be confounded by the processes described with the Sediment Transport Model. Careful selection of appropriate calibration sample locations is essential and should be justified in the context of both the Hydrodynamic Model and the Sediment Transport Model.	As commented in the response to comment EPA-10, the calibration sample locations (i.e., radioisotope cores) will be selected ensuring that they are undisturbed based on current knowledge of dredging and disposal activities in the past.
EPA-14	2.2			Statement of the Problem - The discussion indicates that the analysis of chemical fate and transport processes in the Study Area is needed to perform the evaluation of remedial alternatives during the Feasibility Study (FS). This seems rather limited. This information could be used for other purposes (i.e., to corroborate empirical measurements of site contaminants of potential concern (COPCs) throughout the system, to support the human and ecological risk assessments, and to provide a sensitivity analysis of expected COPC movement in future significant weather events).	The utility of the modeling study is not limited to evaluating remedial alternatives during the FS. As stated in Section 2.3: "The primary objectives of the chemical fate and transport analysis are: 1) develop conceptual site models (CSMs) for sediment transport and chemical fate and transport; 2) develop and apply quantitative methods (i.e., computer models) that can be used as a management tool to evaluate the effectiveness of various remedial alternatives; and 3) answer specific questions about sediment transport and chemical fate and transport processes within the Study Area." A list of specific questions to be answered by the model is provided on p. 5 and 6. These questions incorporate the issues mentioned in the comment. Further, it is important to note that, consistent with the objectives of the RI/FS, the main use for the model will be to establish a baseline flow, sediment transport, and fate and transport conditions that will be used to predict future conditions and inform management decisions regarding risk and feasibility of remediation alternatives. The study will not be focused on understanding past releases; however, the model can be used to inform and test hypotheses on processes affecting those releases.
EPA-15	2.3			Primary Objectives of Modeling Study - Among other questions, the discussion on page 6 (last bullet) states that the chemical fate and transport model will be used to assess the effects of chemical concentrations in the surface-layer of the sediment bed have on total (i.e., dissolved and particle-associated) chemical concentrations in the water column. This question should be expanded to include the surface of the waste material as well as the sediment bed. Both could release dissolved and particle-associated COPCs and the expected behavior could be different.	As presented in Figure 2, QEAFATE Is capable of predicting the transport dissolved and particulate material. In particular, the model can simulate the movement of pore water from the bed to the water column and its associated transport of dissolved COPCs. Figure 2 will be edited to reflect this model capability.
EPA-16	2.4			Contaminants of Potential Concern - Table 1 does not list PCBs as COPCs. Total PCBs are listed as secondary COPCs in the sediment SAP for human health (Table 9) and fish and wildlife (Table 11).	Table 1 will be revised to include PCBs as a secondary COPC.

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EPA-17	4.3			Data Gaps and DQOs: Chemical Fate and Transport Model - The discussion on page 18 states that information regarding the "rate of temporal change of dioxin congener concentrations in the surface-layer of the sediment bed," is a data gap. The Respondents should consider that the same information does not exist for the change in concentrations in the surface-layer of the waste material.	As part of the Time Critical Removal Action (TCRA), the exposed waste will be covered with some type of stable cap in all remedial scenarios being evaluated. After the stabilization is completed, it is safe to assume that the waste will not be not exposed, making the potential fate and transport of waste impoundment derived material significantly different than the existing conditions.
EPA-18	5.4.1			Bed Property Study - The introductory text mentions that as part of the SAP, a total of 68 surface sediment samples (0 – 10 cm) will be collected for characterization of Site and impoundment surface sediment (see Table 13 from the SAP) and that these samples will be analyzed for bulk bed properties (i.e., GSD, dry density) and these data will be used to develop inputs for the sediment transport model. Looking at Figure 4, there are no probing locations indicated within the preliminary site perimeter. So as far as the question of bed cohesiveness, it is not clear where bulk sediment analyses are proposed and why. Please clarify.	See responses to comments EPA-8 and EPA-9.
EPA-19	5.4.4			Upstream Sediment Load Study - Figure 5 depicts the location of the upstream sediment load sampler. What is the basis for proposing this sample location and why is the proposal limited to one sampler?	A significant concern during the design of the upstream sediment load study was the security and protection from vandalism of the automated sampler. After a review of potential locations for the automated sampler, it was determined that the location shown on Figure 5 was the only location in the Study Area with adequate security and protection from vandalism.
EPA-20	5.4.4			Upstream Sediment Load Study - The discussion indicates that the sampler will be serviced once every three days and decisions regarding analysis of total suspended sediment (TSS) concentration will be dictated by the occurrence of rainfall events during the 3-day period. What is the basis for the 3-day window? Is this simply a reflection of the holding capacity of the sampler (with 8 composites per day)?	The holding capacity of the automated sampler is 24 bottles, which is the reason for servicing the sampler every 3 days.
EPA-21	Appendix A	Page 7		Quality Assurance Project Plan for Sedflume Testing - There is a statement on page 7 as follows: "when non-cohesive sands are obtained at a given site, the core will be reconstructed in Sedflume cores." The Respondents should explain this statement, including the reliability of the "reconstructed" core to represent ambient conditions.	As stated in Section 5.4.2, only cohesive sediment cores will be collected for this study. Thus, the statement from the QAPP regarding non-cohesive cores is not applicable to this study. The text will be revised and the discussion related to non-cohesive cores, and reconstructed cores, will be deleted.
EPA-22	Figure 1			"Houston Shipping Channel" is not the name used in text. And is not recognized by the group.	Figure 1 will be modified so that the label reads "Houston Ship Channel".
EPA-23	Figure 2			Box for hydrodynamic model does not depict/include the "salt equations" or density-driven processes mentioned on page 8 of text.	Figure 2 will be modified to include density-driven currents.
EPA-24	References List			Citations on page 32 include "University of Houston and Parsons, 2008. Total maximum daily loads for dioxins in the Houston Ship Channel. Contract No. 582-6-70860, Work Order No. 582-6-70860-02. Quarterly report No. 3. Modeling Report – Revision 2. Prepared in cooperation with the Texas Commission on Environmental Quality and the U.S. Environmental Protection Agency. University of Houston and Parsons Water & Infrastructure." The correct date is 2006, need to edit the reference list citation.	The November 2008 document is Work Order No. 582-6-70860-18, and the citation will be corrected.
EPA-25	Section 2.2			"…analyze the fate and transport of particle-associated chemicals within the Site and Study Area…". Study should not be limited to particle-associated chemicals. There needs to be some attention paid to dissolved transport, especially with regard to containment/remediation and the possible need for geosorbents. Granted, some apparently dissolved transport is likely to be on colloidal particles that pass through filters, but the issue remains that dissolved or colloidal transport might escape from containment adequate for sediment.	The term "particle-associated chemical" does not mean that the chemical is totally adsorbed to sediment particles. For any particle-associated chemical, the total chemical concentration in the water column or sediment bed is the sum of the dissolved and particulate concentrations. The relative proportions of dissolved and particulate concentrations is determined by the partition coefficient for a specific chemical, with the relative amount of the particulate component increasing as the value of the partition coefficient increases. The chemical fate and transport model will be used to predict the transport of both dissolved and particulate concentrations. This is indicated by the questions to be addressed by the study, see the final bullet on page 6.
EPA-26	Section 3.1			"…sediment bed composition (i.e., relative amounts of clay, silt, and sand from different sources);…". Will sediment model track size classes separately, following each particle from point of origin, as this sentence seems to imply? Or does model track median particle size and statistically estimate size class distribution (which would not link back to "different sources")? How are "different sources" of particles tracked by model?	The sediment transport model will simulate the erosion, deposition and transport of four size classes: 1) clay/silt (< 62 μm); 2) fine sand (62-250 μm); 3) medium/coarse sand (250-2,000 μm); and 4) gravel (>2,000 μm). The model simulates temporal and spatial changes in the composition of sediment in the water column and sediment bed. In addition, the model has the capability to track the fate and transport of sediment from specific locations or sources. The technical memo will be edited to incorporate more details on the sediment class definition.

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EPA-27	Section 3.1			Will particulate organic carbon (POC), total organic carbon (TOC), and/or dissolved organic carbon (DOC) be in the sediment and chemical models? Mention of partitioning implies yes, but not clearly stated. Whether or not explicitly mentioned in this plan, future review of work should assure that these organic parameters are included.	The model will not explicitly simulate transport and fate of organic carbon (i.e., POC, DOC). The effects of organic carbon on partitioning are incorporated into the model through the use of user-specified POC content in the water column and sediment bed.
EPA-28	Section 3.1			"The sediment transport model predicts the transport and fate of inorganic sediment; the transport and fate of organic solids is not simulated by the model.". Then the "dissolved" fraction in the chemical fate model must simulate/include any organic solid transport of COPCs, whether dissolved, colloidal, or particulate.	The chemical fate and transport model simulates the transport of total chemical concentration; the transport of dissolved and particulate chemical concentrations are not explicitly simulated by the model. The model predicts temporal and spatial changes in total chemical concentration in the water column and sediment bed. Given the predicted value of total chemical concentration at a particular location, the dissolved and particulate concentrations are calculated using standard partitioning equations.
EPA-29	Section 3.2.1			Hydrodynamic modeling: It is not clear where the lower boundaries of the hydrodynamic model are proposed to be. Figures imply somewhere in vicinity of Lynchburg Ferry, and Table 2 refers to the tide gauge at Battleship Texas. Section 4 implies the Battleship gauge will provide "water surface elevation and salinity at the downstream boundary." There needs to be two boundaries at that area, one for the interface with the Buffalo Bayou branch (i.e. the main ship channel, segments 1006, 1007), and one for the interface with the lower San Jacinto River/HSC reach from Lynchburg to Galveston Bay (segment 1005, plus other "side bays"). Sea tides come up from Galveston Bay, and from the Lynchburg intersection can propagate both up the San Jacinto River and up the main channel (Buffalo Bayou branch). The Buffalo Bayou branch is really more like a "side stream boundary", it is not "downstream" from tidal perspective. Downstream river flow from the San Jacinto River ("north") can go both down channel toward Galveston Bay ("south") and up Buffalo Bayou ("west"), depending on how tide and flow interact at the 3-point Lynchburg intersection. Sediment also may be transported west, south, or north from there. The model should not combine west and south boundaries, or it could be misleading with regard to where water and transported load goes to or comes from. The water body or area called Old River is another complex detail. It provides a circular loop back to the San Jacinto channel adjacent to the 3-way intersection. Old River is clearly meant to be within the model domain (Figures 3 and 4), as it should be, but it cannot represent the main channel reach along Buffalo Bayou.	It is envisioned that the downstream boundaries of the hydrodynamic model will be located at the southern extents of the main (eastern) channel of the San Jacinto River and the Old River channel. Preliminary model testing has demonstrated that specifying the downstream tidal boundary at these two locations produces realistic tidal circulation within the Study Area. However, it will be analyzed the possibility to modify the downstream boundaries, so that the model can provide separately the flow going to the west and to the south in the Houston Ship Channel. See response to comment EPA-54.
EPA-30	Section 4.1 Table 2			Because of lower boundary issues mentioned above, the hydrodynamic model could consider using the Morgan's Point tide gauge to represent the "south" boundary. Or, could develop some way to represent both lower boundaries based on the Battleship gauge. The Battleship tide gauge is near the "west" boundary in Buffalo Bayou.	If the water surface elevation data from the NOAA gauging station at Battleship Texas State Park does not produce adequate calibration results, then other tidal data sources will be considered and evaluated.
EPA-31	Section 4.2			"High-flow events are the focus of a sediment load study because, typically, a majority of the annual load occurs during a small number of high-flow events.". This study should focus on the redistribution of "old" sediment already in the system, at least as much as on the annual load of "new" sediment entering the system. Other comments below address that the proposed "high-flow event" of 10,000 cfs for sampling purposes is not very high for the site. A 10,000 cfs flow in the SJR may not be a major annual loading event. Not clear if the statement on page 16 is about model simulation of larger events (>>10,000 cfs).	The statement referred to in this comment addresses the issue of external sediment loading from the San Jacinto River to the Study Area. The "sediment load study" means the field study to collect data that can be used to estimate the annual load of sediment from the river to the Study Area; it is not referring to the sediment transport modeling study, which will evaluate the transport and fate of sediment within the Study Area.
EPA-32	Section 4.2			"bed elevation change" is mentioned as information needed. Not clear if that is to include changes due to subsidence, past or present or future, as well as due to sediment dynamics. This draft does not say how long the model simulation periods will be (a few months? A few years? A few decades?), for either calibration or predictive simulations of future conditions.	In the context of this type of modeling, "bed elevation change" refers to changes due to sediment dynamics, and does not include changes due to subsidence, which has essentially ceased in the study area based on Harris County Subsidence District data and observations. The calibration period will be determined after the field studies are completed and the sediment transport data area analyzed. The length of predictive simulations for the FS will be determined after the model calibration is completed. However, it is likely that multi-decadal simulations (e.g., 20 years) will be used for the FS evaluations. The technical memo will be edited to include a clarification regarding the proposed long-term predictive simulation runs.
EPA-33	Appendix A			"It can be seen in this plot that the surficial sediments erode easily at lower sediments, but at lower levels in the core the sediments are much more difficult to erode requiring much larger shear stresses.".	The sentence in Appendix A will be revised to state: "It can be seen in this plot that the surficial sediments erode easily at lower shear stresses, …"

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				First part of sentence does not make sense. Perhaps the highlighted word "sediments" was not the intended word…may have meant to say "shear stresses" or similar?	
EPA-34	Appendix A			"…and average bulk properties will be plotted with binned depth.". Perhaps this refers to statistical "bins" for categorizing data, but it is not clear.	The erosion rate tests are conducted using cycles of shear stress (i.e., increasing from low to high applied shear stress) over a specified depth interval in the core, which is typically about 5 cm in thickness. The "binned depth" refers to a depth interval for a particular shear stress cycle. The text in Appendix A will be revised as needed to clarify this issue.
EPA-35	Appendix A			Appendix A: "Quality assurance objectives and results will be assuaged in the process of preparing the report.". Is 'assuaged' the intended word?	This sentence in Appendix A will be revised to state: "Quality assurance objectives and results will be assessed …."
EPA-36	Appendix A			"…6 cores represents approximately on week in the field." Replace 'on' with 'one'.	The text in Appendix A will be revised as requested.
EPA-37	Appendix A			"Coring locations will be chosen with the following tenants in mind:…". Replace 'tenants' with 'tenets'.	The text in Appendix A will be revised as requested.
EPA-38	Appendix A			"…knowledge of sediment variability both aerially and with water depth…". Replace 'aerially' with 'spatially'.	The text in Appendix A will be revised as requested.
EPA-39	Section 4.3			"…(Univ. of Houston and Parsons 2008)." That needs to be 2006 instead of 2008.	See response to comment EPA-24.
EPA-40	Section 4.3			Interpretation of radioisotope data from sediment cores to establish the age of sediment or rates of change seems to be a very subjective process. There will be a lot of uncertainty associated with net sedimentation rates and temporal change in dioxin/furan concentrations derived from such analyses, especially in relatively shallow and dynamic situations like the San Jacinto delta.	The analysis of the radioisotope core data will use well established procedures, which are objective, that have been applied to numerous cores at a large number of contaminated sediment sites. These procedures will also provide quantitative estimates of uncertainty in the net sedimentation rates derived from the age-dating analysis of the cores.
EPA-41	Section 5.3.1			"The mean flow rate in the San Jacinto River is 2,200 cfs, and high-flow events with return periods of 2, 10, and 100 years correspond to flow rates of 31,600, 107,000 and 329,000 cfs, respectively.". Cite the source of, or provide the basis for, these flow statistics.	A Log Pearson Type 3 flood frequency analysis of historical flow rate data collected at USGS gauging stations on the San Jacinto River were used to determine these flow statistics. The period of record for the flow rate data was 1985-2009.
EPA-42	Section 5.3.1			Plan proposes 10,000 cfs as defining a high-flow event for hydrodynamic monitoring purposes. Since the study plan anticipates two high-flow events during a month or so, and since the cited 2-yr event (31,600 cfs) is significantly larger than 10,000 cfs, the proposed high-flow events might be considered "slightly-higher-than-normal-flow events" in the scheme of river dynamics. Modeling should be able to simulate truly large high-flow events.	Collecting hydrodynamic and sediment transport data during high-flow events at a contaminated sediment site is always uncertain because of the relatively low probability of a high-flow event occurring during a specific time period. Constraints on the RI/FS schedule means that the modeling study needs to be completed within a specific time period. Thus, a limited period of time is available to collect field data and, typically, a rare high-flow event (e.g., 10-year flood) will not occur during this time period. Thus, data collected during elevated high-flow events (i.e., greater than 10,000 cfs for this study) are used as best as possible for model calibration and validation. This approach has been used successfully at other contaminated sediment sites where the calibrated model was used for 100-yr flood event providing reliable results.
EPA-43	Section 5.3.1			"In the region upstream of the primary Study Area, a total of 15 cross-channel transects will be surveyed. In the region downstream of the primary Study Area, a total of 12 cross-channel transects will be surveyed as shown in Figure 3.". Transects marked on Figure 3 cross only the deep channel in upstream reach – how will bathymetry of the wide shallow areas be determined? Water and sediment move there also. There should be a lot of 3-ft by 3-ft grids in the model to cover the shallow water area.	Bathymetry data from NOAA nautical charts are available in the wide shallow areas. These data are adequate for specifying model inputs in those areas.
EPA-44	Section 5.3.1			Transects downstream from Site: much of Old River is often covered by parked barges, getting the transect data may be more difficult than expected.	The field study crew will endeavor to overcome potential obstacles and collect as much data as possible. Changes to proposed sample locations that may be required as a result of obstacles encountered during sampling will be discussed with EPA during the field sampling event.
EPA-45	Section 5.3.1			Model lower boundary, vicinity of Lynchburg Ferry/De Zavalla Point: since the model needs two lower boundaries to separately characterize the "south" and "west" branches of channel (see Comment #29) some bathymetry to characterize those boundaries is needed.	Bathymetry transects are located in the immediate vicinity of the two downstream boundaries, see Figure 3.
EPA-46	Section 5.4.1.1			Sediment probing in Old River may be obstructed by parked barges. May need to define a procedure to use in case the "pre-programmed target coordinates" are under a group of barges. Also, not clear how the 6-inch interval markings on probe are read. Bottom will not be visible at most sites, so unlikely to read marks at sediment surface; water surface could index to markings, but not clear if depth to bottom will be consistent around a sample location.	The field study crew will endeavor to overcome potential obstacles and collect as much data as possible. The water surface will be used to index the markings.
EPA-47	Section 5.4.2			"The locations of these cores will be determined upon completion of the sediment bed probing study (see Section 5.4.1.1) and areas of	Only cohesive bed sediments will be included in the Sedflume study. The text will be revised and the reference to testing of non-cohesive cores will be deleted.

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				cohesive bed sediments have been identified.". Does this indicate that non-cohesive bed sediments will not be included in the Sedflume study? Appendix A indicates that non-cohesive materials can be Sedflume tested.	
EPA-48	Section 5.4.3			"(^{137}C)" needs 's' inserted after 'C' to represent cesium instead of carbon. Also, what if the anticipated cesium peak occurs within sub-sample interval that is not selected for analysis, e.g. 8 to 12 cm interval? What if true cesium peak has eroded away, leaving an apparent peak that does not correspond to assumed 1963 date of peak? How could analyst tell the difference between these two possible situations?	The text will be revised as requested. If needed, the archived sub-samples can be submitted for laboratory analysis and the additional data would be used to refine the age-dating analysis, as described at the end of Section 5.4.3. in addition, the analysis of the ^{137}Cs activity profile is not done in isolation. This analysis is done in conjunction with the analysis of the ^{210}Pb activity profile, as well as physical information for the core, resulting in several lines of evidence that are used to characterize deposition rates.
EPA-49	Section 5.4.3			"Sub-samples will be submitted for laboratory analysis of ^{137}C and ^{210}Pb activity from every eighth sub-sample interval, starting with the 0 to 4 cm interval.". Sounds like second selected sub-sample would be from 32 to 36 cm interval. Is that correct interpretation? Seems like peaks might fall within untested intervals. Also, need to add 's' after 'C' to indicate cesium instead of carbon.	The second sub-sample will be from the 32-36 cm interval. If needed, the archived sub-samples can be submitted for laboratory analysis and the additional data would be used to refine the age-dating analysis.
EPA-50	Section 5.5			Dioxin profiles in sediment may indicate an erratic "rate of temporal change," with increases and decreases in quick succession (as seen in profiles from nearby). Not clear how a synthetic average net rate of change would be used.	Temporal changes in dioxin concentrations will be used both qualitatively and quantitatively to evaluate the predictive capability of the chemical fate and transport model.
EPA-51	Section 2.1	Page 3		Site History states at the end of the first paragraph: "For the purposes of the modeling study, the Study Area is defined as the San Jacinto River from Lake Houston to the Houston Ship Channel (Figure 1)." It is highly probable that transport of chemicals of potential concern (COPCs) from the Site are beyond the intersection with the Houston Ship Channel, thus the Study Area should be extended farther downstream to the entrance of the Houston Ship Channel into Galveston Bay. We understand that other sources of COPCs are likely and thus monitoring and design of the study should take this into consideration while accurately assessing the extent of COPCs fate and transport downstream.	Currently, we believe that the spatial extent of the modeling domain is adequate for meeting the objectives of the study and answering the questions listed on p. 5 and 6. If the results of the modeling study indicate that the spatial extent of the modeling needs to be expanded, then it will be possible to do so in the future.
EPA-52	Section 2.1	Page 4		Site History makes reference in the final paragraph to "late successional stage estuarine riparian vegetation." During a Site visit, the Site seemed dominated by hackberry trees which are often considered pioneer or early successional stage trees in this portion of Texas. The basis for the characterization of the Site as having vegetation characteristic of a late successional stage should be validated to verify this description.	This sentence in Section 2.1 will revised as follows: "The impoundments are currently occupied by estuarine riparian vegetation to the west of the central berm …"
EPA-53	Section 3.1	Page 9		Description of Modeling Framework. Will any of the system of models account for movement in the water column and sediments due to boat turbulence?	The effects of boat movement on sediment transport will not be explicitly incorporated into the modeling analysis. Water column measurements and predictions will implicitly include the collective effects of propeller wash, but this kind of model can't include the short term impact of propellers. Propeller wash models exist and are used to evaluate the potential scouring effects of vessels mostly for engineering design of alternatives during the feasibility study. The need for a propeller wash model may arise during the feasibility study but it cannot be determined at this stage.
EPA-54				On comment EPA-29, the resolution states: "It is envisioned that the downstream boundaries of the hydrodynamic model will be located at the southern extents of the main (eastern) channel of the San Jacinto River and the Old River channel. Preliminary model testing has demonstrated that specifying the downstream tidal boundary at these two locations produces realistic tidal circulation within the Study Area. However, it will be analyzed the possibility to modify the downstream boundaries, so the model can provide separately the flow going to the west and to the south in the Houston Ship Channel." After consideration, the EPA team concludes that the modeling must be developed with separate downstream boundaries opening to the west and to the south. The rationale is that the hydrodynamic model should not combine west and south boundaries, as it would be misleading with regard to where water and transported load goes to or comes from. Please revise the resolution to reflect this directive.	The downstream boundaries of the model will be moved to: 1) western boundary in the Houston Ship Channel that is approximately 0.50 to 0.75 mile upstream from the mouth of the San Jacinto River; and 2) southern boundary that is about 0.25 mile southeast of the Lynchburg Ferry route. Moving the downstream boundaries of the model to these locations will improve the predictive capability of the model, with respect to water movement in the San Jacinto River and Old River channel.

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EPA-55				To ensure that calibration of the hydrodynamic and chemical fate models are valid, water column samples analyzed for dioxin should be collected within the same time period as other model calibration data. Directly comparing model predictions from the calibration exercise to synoptic dissolved and suspended solids dioxin concentration measurements will better validate the partitioning, hydrodynamics, and sediment dynamics used in the modeling. Water samples for model calibration can be collected at two or more sites within the area to be simulated by the model. Suggested locations include: (1) in proximity to the pits, perhaps in the river channel near the highway bridge slightly downstream from the site; (2) somewhere upstream from the pits, near or slightly beyond the preliminary site perimeter. More than two water sampling sites may be used. Sampling points should be located in places that will correspond to model output points, to ease comparisons during calibration. Water samples should be collected several times during the period monitored for model calibration. The water sampling method used should allow detection across a wide range of possible concentrations, and allow the calibration data to be compared to previous data. The high-volume sampler method used by the TMDL project is strongly recommended.	Water column dioxin concentration data have been collected in the San Jacinto river and were used to evaluate the predictive capability of the TMDL dioxin model of the Houston Ship Channel and San Jacinto River. Those data will be used during the calibration and validation of the chemical fate and transport model in this study. With respect to collecting field data (i.e., dissolved and particulate dioxin concentrations in the water column) to evaluate partitioning, it is difficult and problematic to obtain reliable dioxin partitioning data due to variability and uncertainty in field data. Ranges of partition coefficients for various dioxin congeners are well established in the peer-reviewed literature, making it unnecessary to collect site-specific data prior to finalizing the chemical fate and transport model. We propose to develop and calibrate the chemical fate and transport model as discussed in the modeling work plan. The sensitivity of the model to value of the dioxin partition coefficient will be evaluated after the calibration process is completed. If the results of that sensitivity analysis indicate that additional site-specific data are needed to reduce the uncertainty in model predictions, then a field study will be designed and conducted to provide the appropriate data related to dioxin partitioning. As described in the RI/FS Work Plan, collection of surface water for chemical analyses will also be considered if there are unacceptable uncertainties associated with the use of estimated surface water quality parameters in the risk assessments. Knowledge and insights gained from the modeling study and the risk assessments will be used to design that field study, if it is needed.
USGS-1	Section 2.3			"The primary objectives of the chemical fate and transport analysis are: 1) develop conceptual site models (CSMs) for sediment transport and chemical fate and transport." A better explanation of CSMs and those that are going to be developed for this system specifically is needed. These are stated as an important product in several parts of the proposal but it is difficult to see why they are important or how they might be used without a better description or diagram to reference. I see that a general description is given on p. 11 in Section 3.2 but this does not describe what the preliminary CSM for this project looks like and how it will be used.	At any contaminated sediment site, a large number of physical and chemical processes are present. However, not all of these processes need to be included in the modeling framework in order to achieve the objectives of the modeling study and adequately answer the specific questions related sediment transport and chemical fate and transport. The CSMs are used to identify the primary processes affecting sediment transport and chemical fate and transport in the study area, which helps to keep the modeling study properly focused. The CSM also helps to evaluate the reliability of the model's predictive capability. For example, are model predictions consistent with the CSM? Finally, the CSM is used as a tool to synthesize and integrate the results of modeling and data analyses and effectively communicate those results to stakeholders. Additional discussion of a CSM, including an example from another site, and how it is used will be added to the text. It is not possible to provide specific information about the preliminary CSM for this site because work on it has not begun yet.
USGS-2	Section 2.3			Flow is not mentioned as being measured at the sampler so it is assumed the composites are time-weighted and not flow weighted, with the same number of samples being collected on high flow days as low flow days. No measured flow at the sampler will make it difficult to 1) determine if the 10,000 cfs criteria is met and 2) calculate an observed load for source comparisons. By using time-weighting and not flow-weighting, the concentrations during storms and higher volume flows will likely be underestimated.	Flow rate data are collected at the Lake Houston Dam and that information will be used to determine the 10,000 cfs criteria and to correlate TSS concentrations to flow rate. The portion of the watershed that is between the dam and sampling location is relatively small allowing the flow to be adjusted using drainage area proration. Current meter (ADCP) data collected within the study area will be used to the fullest extent possible during the analysis of the TSS concentration data collected within the study area.
USGS-3	Section 2.3			Will the sediment and contaminant model include the entire channel downstream of the reservoir? Without a watershed model to provide runoff loads of sediment, how will sediment inputs at the upstream (reservoir outlet), tributary boundaries, and immediate contributing area to the Channel be determined? For calibration of the sediment model, will the observed TSS concentrations at the automatic sampler and the sediment accumulation amounts over certain time periods in the cores be used?	The numerical grid of the model will extend up to Lake Houston Dam. The TSS concentration data collected at the automated sampler will be used to develop a sediment rating curve (i.e., correlation between TSS concentration and flow rate). It will be assumed that this sediment rating curve can be used to estimate the incoming sediment load at the upstream boundary of the model. As with all sediment transport modeling studies, uncertainty will exist in the incoming sediment load that is estimated from the sediment rating curve. Thus, it is possible that the incoming sediment load may need to be adjusted, within a reasonable range, during model calibration. The primary calibration target for the sediment transport model will be net sedimentation rates determined from age-dating of the radioisotope cores. The TSS concentration data will be used during model validation.
USGS-4	Section 2.3			High flows passing the sampler will include possible high releases from the reservoir and storm runoff from intervening drainage area – whether or not the flow originated upstream of the reservoir will have an impact on the sediment concentrations, as the reservoir could be a sediment sink. Will there be an effort made to maintain constant reservoir releases during the automatic sampling period?	No effort will be made to control reservoir releases because limited control exists on the small gated spillway. The dam was not designed for flood control or controlling flow in the San Jacinto River downstream of the dam.
USGS-5	Section 3.1			It would help if more specific target questions were provided that would more clearly demonstrate the information that the model needs to provide and will provide on the temporal and spatial scales needed for management decisions. The TMDL Model for dioxin for this area is a RMA2 hydrodynamic model linked to a WASP 2-dimensional model.	The TMDL model was used to address water quality issues and the spatial resolution of that model is insufficient to meet the objectives of this modeling study, which are focused on evaluating the effectiveness of various remedial alternatives for a contaminated sediment site. The sediment transport model requires accurate prediction of bed shear stress because this variable significantly affects erosion and deposition processes. For this reason, the resolution of the model needs to be high enough to accurately represent the hydrodynamics of the study area. In addition, a 3-D model is

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				The TMDL study states that "While a large number of small model elements were used in the RMA2 hydrodynamic models to simulate the sinuosity of the main channel and bayous and the change in bottom elevations in the channel and Upper Galveston Bay, there was no need for high spatial resolution simulations in the WASP water-quality model, both from a water quality management perspective and because field measurements of water quality for calibration were not of high spatial resolution." What has changed - Why move to 3-D, more spatial resolution? Will any samples be analyzed for the COPC's themselves? Will you use the limited water-quality data collected in previous studies to calibrate the model and will the measurements be at a spatial resolution sufficient to justify the higher spatial resolution of this model?	needed for simulating the effects of density-driven circulation, which effects water column transport of suspended sediment and bed shear stress. See the response to comment EPA-55 concerning water column chemical concentration data.
USGS-6	3.1			What were the limitations of the existing model that has made it unacceptable for use now in evaluating remedial actions and developing a conceptual model? Why can't the existing WASP model be updated to be a 3-dimensional model with more contaminants? What do SEDLZJ and QEAFATE offer that are not offered by the sediment and contaminant transport modules within WASP?	The sediment transport dynamics in WASP are simplistic and not sufficiently reliable to meet the objectives of this study. SEDZLJ is a state-of-the-science sediment transport model that is capable of simulating cohesive and non-cohesive sediment. While QEAFATE and WASP have similar capabilities for chemical fate and transport, the primary advantage of QEAFATE is that is linked to SEDZLJ. The SEDZLJ-QEAFATE modeling framework has been extensively tested and successfully used at a number of contaminated sediment sites.
USGS-7	3.1			The choice of the sediment size classes seems arbitrary. In choosing the sizes, are you considering research performed on the CPOC'c that relates sediment particle size to bioavailability? Work done on suspension of dioxin congeners (<u>Environmental Pollution</u>, Vol 157 Issue 7, July 2009, pp 2159-2165, Kitamura and others) uses classes as fine as 1-10 μm. Your smallest class is less than 62 μm, a sand break analysis. Is your choice of this size based upon laboratory methods or contaminant partitioning?	The selection of the four sediment size classes was not arbitrary. It was based on experience gained from previous modeling studies at contaminated sediment sites (e.g., Upper Hudson River, Patrick Bayou, Lower Willamette River) where use of these four sediment size classes has produced reliable models that met the objectives of the study. The clay/silt sediment is represented as a single size class because: 1) clay/silt particles suspended in the water column flocculate and are not transported as discrete particles; 2) the erosion rates of different particle sizes in the clay/silt cannot be measured; and 3) the particle size distribution of clay/silt sediment in the incoming sediment load cannot be estimated. The ability of the model to predict the composition of the sediment bed (i.e., site-specific data on clay/silt/sand/gravel content) will be one method for evaluating the suitability of using four sediment size classes. Additional discussion will be added to the text.
USGS-8	3.2			A sensitivity analysis will need to be performed that will give management a sense of the error bars and risk associated with the estimation of contaminant concentrations and locations. For instance, the sensitivity analysis could test the sensitivity of the simulated concentrations to changes in the user defined POC levels, the partitioning coefficients, and uncertainty in measured TSS at the sampler. With a three dimensional model for a twenty years period, it is conceivable that a model run could take as long as a week or more. How many model runs will be performed for the purposes of calibration, verification, sensitivity analyses, and management scenarios?	Sensitivity analyses will be performed for the sediment transport and chemical fate and transport models to analyze the uncertainty on the input parameters, see Sections 3.2.2 and 3.2.3. Conducting multi-year simulations can be challenging, however, Anchor QEA has successfully conducted these types of simulations during other modeling studies at contaminated sediment sites (representative reports and journal articles from previous studies will be provided to EPA, USGS and stakeholders). The number of model simulations that will be conducted during this study cannot be determined at this time.
USGS-9	3.2			Will the hydrodynamic model simulate the channel morphology and periodic inundation of the surrounding area during wetter time periods and will this be calibrated to any existing mapping or aerial photography of channels during dry periods and during flooding? During inundation periods will release of contaminants be estimated?	The model has the capability to simulate the flooding and drying of inter-tidal and floodplain areas. The capability of the model to predict the extent of floodplain inundation during high-flow events will be evaluated using available aerial photos and other information. The chemical fate and transport model can simulate interactions between the bed and water column in areas that are inundated.
USGS-10	3.2			Once the model is calibrated to sediment, will the model be able to be used for all the COPC's listed, based upon partition coefficients? Will the contaminant transport model(s) be calibrated with contaminant water-quality data?	Yes, the calibrated model will be able to simulate the transport and fate of a range of chemicals, provided that sufficient data are available to specify initial conditions for bed concentrations and boundary conditions for incoming loads.
USGS-11	3.2.3			This should probably read "…and transport of various dioxin and difuran congeners…"and "…Study Area, a dioxin and difuran congener will be included in the modeling…" Distinction between these two classes should be made where appropriate throughout the proposal.	The text will be modified as noted in the comment.
USGS-12	4.1			How are changing salinities factored into the hydrodynamic model? Are they assumed to correlate to freshwater discharge? This is not always the case given that downstream salinity may vary based on other factors such as tides and ambient salinities in the estuary.	The hydrodynamic model simulates spatial and temporal changes in salinity within the study area. Vertical and horizontal gradients in salinity generate density-driven currents in the model. Available data will be used to specify temporal changes in salinity at the downstream boundary of the model.
USGS-13	4.1 and 4.2			If storm events do not occur, how will data gaps (e.g. TSS loads and current velocities) be adequately filled given the short timeline for completing each objective (1 month)? It is expected that two high-flow events of at least 10,000 cfs would occur during this period. A flow-	As stated in Sections 5.3.1 and 5.4.4: "If the magnitude of high-flow events during the data collection period does not reflect a suitable range of conditions (as determined by the project technical team) or if baseline conditions are not re-established between events to sufficiently identify distinct events, the data collection period may be extended on a bi-weekly basis." Thus, the intent is to collect sufficient data for the modeling study and not be limited to a one-month

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				duration analysis of streamflow data from a nearby gaging station might provide a better statistical estimate of how long it might take to capture the desired highflow conditions. Instead of 2 events of 10,000 cfs, what is the expected peak flow for a single event during deployment? How will some of the important spatial and temporal variability of TSS related to storms and droughts be accounted for in the model?	sampling period if adequate data cannot be obtained during that time period. The potential effects of temporal variability of incoming sediment load on model predictions will be evaluated during the sensitivity analysis.
USGS-14	4.3			You use the term the “rate of temporal change of chemical concentrations in the surface and near surface layer of the sediment bed.” This is confusing as rate is a temporal change. Do you mean the rate of exchange between the surface and near surface or between the water column and the sediment is changing over time? Or do you mean the rate of accumulation in the core?	This statement means changes in chemical concentrations in the surface-layer of the bed between two or more points in time. Additional discussion will be added to the text to clarify this statement. In addition, text will be included that discusses the conceptual approach to model calibration.
USGS-15	4.3			Sediment deposition in this section of the San Jacinto must be dynamic with episodic events such as hurricanes and dredging interrupting the depositional history. The sampling strategy was not entirely clear but some higher resolution sampling at finer increments along the core may be needed to pinpoint the137Cs peak. What is the contingency plan if the core dating is not clear?	The radioisotope cores will be sub-sampled in 4-cm intervals. The sub-samples that are not initially sent to the laboratory for analysis will be archived. If the sub-samples which are analyzed provide data that produce unreliable age-dating results, then a decision will be made about retrieving the archived sub-samples and submitting those sub-samples for laboratory analysis.
USGS-16	5.3.1			A sentence in the first paragraph to better define the purpose of the Current Velocity Study should be included. Something like: The purpose of the ADCP deployment is to collect water elevations, water velocity, water temperature, and water conductivity in the San Jacinto River, near the waste impoundments.	The text will be modified as noted in the comment.
USGS-17	5.4.4			The automatic sampler draws water at a discrete point in the channel. To apply the TSS concentration measured by the sampler to the entire channel assumes a well-mixed channel and representative sample. Equal width or equal depth increment sampling should be performed in conjunction with at least one automatic sample to ensure that this is a valid assumption. Also, in addition to the composite sample from the sampler, a grab sample could be collected during significant events to capture a first flush effect. Perhaps this would not have to be limited to the one month sampling period. Also, will the automatic samples be analyzed for sediment size? Automatic samplers do a poor job of collecting particle sizes greater than 100 µm. If not, will the sediment partitioning be calibrated in the model using core data?	The ability of the automated sampler to collect representative samples will be evaluated by obtaining equal width increment (EWI) samples along a cross-channel transect in the vicinity of the automatic sampler location. One EWI sampling survey will conducted during each of the two high-flow events that will be sampled during the upstream sediment load study (i.e., total of two EWI sampling surveys). The samples will not be analyzed for grain size distribution. The capability of the sediment transport model to predict spatial variations in bed composition will be evaluated during model validation.
USGS-18	5.4.4			Where does the influence of the tide end? Is it downstream of the automatic sampler, as this would affect the concentrations sampled there? Proper laboratory analysis of the TSS for the automatic sampler should include washing the sample with deionized water prior to drying the filtered sample, as significant amounts of dissolved material (salts) may add weight to the sample.	Tidal effects extend upstream to Lake Houston Dam. The TSS concentration samples will include washing the sample with deionized water is suggested in the comment.
USGS-19	5.4.4			The automatic sampler will not be capturing the sediment inflow from overland flow or erosion from adjacent lands into the Houston Ship Channel. Are the sediment loads and the contaminant loads from the actual contamination area and downstream of the automatic sampler being estimated as input to the Channel model?	Chemical loads from the former waste impoundments will not be included in the model because those chemical loads will be eliminated during the Time Critical Removal Action (TCRA) which is currently being conducted. Available data will be used to estimate chemical loads/concentrations at the downstream boundary of the model.
USGS-20	5.4			In general, a quality assurance and quality control plan for this sampling is absent. Will there be blanks, spikes, duplicates collected that relate to both the water column and sediment samples? In addition the samples handled may be hazardous. Will the samples, especially the cores, be treated as hazardous waste and handled as such, including the appropriate forms for chains of custody mentioned and the final disposal of the soils in hazardous waste facilities?	As noted in Section 5.1 (p.20): “The field tasks described in the sections below will follow procedures described in the SAP (Anchor QEA and Integral 2010) that been previously submitted and approved by USEPA.” The Sampling and Analysis Plan (SAP) includes a Quality Assurance Project Plan (QAPP) and Health and Safety Plan (HASP).